

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of the claims in this application.

Listing of Claims

1 – 9. (canceled)

10. (currently amended): A microarray device having addressable electrodes for detecting binding of a target molecule to a capture molecule, comprising:

(a) a microarray having a plurality of addressable electrodes covered by a porous reaction layer attached to the addressable electrodes and having a plurality of capture molecules attached to the porous reaction layer at sites over the electrodes, ~~wherein the porous reaction layer has a thickness of approximately 0.1 microns to approximately 10 microns, wherein the capture molecules are formed by *in situ* synthesis using electrochemical techniques using electrochemical reagents generated by the addressable electrodes and which electrochemically remove protecting groups during synthesis to locate the capture molecules at selected electrodes of the microarray, wherein electrophoresis is not used to attach the plurality of capture molecules at the sites corresponding to the electrodes,~~ wherein the porous reaction layer allows electrochemically-generated protons to contact the capture molecules;

(b) a plurality of target molecules bound to the capture molecules, wherein the target molecules have an oxidation/reduction enzymatic moiety, that is attached to the target molecules through a combination selected from the group consisting of an antibody, ~~and anti-idiotypic~~ antibody, and antigen combination, a biotin and streptavidin binding combination, a biotin and avidin binding combination, and combinations thereof;

(c) a substrate molecule proximate to the oxidation/reduction enzymatic moiety, wherein the ~~substrate~~ substrate molecule creates a local voltage signal when catalyzed by the oxidation/reduction enzyme through local generation of electrochemical reagents; and

(e) a voltage signal measuring device electrically connected to each electrode on the ~~array~~ microarray, wherein the voltage signal measuring device detects an electrical signal at each of the sites having the capture molecules, wherein detection of binding of the target molecules to

the capture molecules is measured by different electrical signals at the sites having the target molecules and the sites not having target molecules.

11 – 12. (canceled)

13. (previously presented): The microarray device of claim 10, wherein the oxidation/reduction enzyme is selected from the group consisting of laccase, horseradish peroxidase, β -galactosidase, glucose oxidase, alkaline phosphatase, dehydrogenases, and combinations thereof.

14 – 15. (canceled)

16. (previously presented): The microarray device of claim 10, wherein the porous reaction layer is made from a polymeric material selected from the group consisting of polyvinyl alcohol, polyvinyl acetate, polyvinyl alcohol, tricellulose acetate, polyurethane, agarose, controlled porosity glass with a PTFE resin, dextran, epoxy-based polymers, and combinations thereof.

17. (previously presented): The microarray device of claim 10, wherein the capture molecules are selected from the group consisting of oligonucleotides, polypeptides, antibodies, glycosylated polypeptides, and polysaccharides.

18. (previously presented): The microarray device claim 10, wherein the target molecules are selected from the group consisting of DNA, RNA, single-stranded DNA, ribosomal RNA, mitochondrial DNA, cellular receptors, glycosylated membrane-bound proteins, non-glycosylated membrane-bound proteins, polypeptides, glycosylated polypeptides, antibodies, cellular antigenic determinants, organic molecules, metal ions, salt anions and cations, and combinations thereof.

19. (previously presented): The microarray device of claim 10, wherein the oxidation/reduction enzymatic moiety comprises a first antibody attached to the 3-prime end of the target molecules, an antigen attached to the first antibody, a second antibody attached to the antigen, a streptavidin-biotin complex or an avidin-biotin complex attached to the second antibody, and an oxidation/reduction enzyme attached to the streptavidin-biotin complex or the avidin-biotin complex.